

**Question:** How can we extract and visually see DNA from a cell?

**Background:**

DNA (deoxyribonucleic acid) is the genetic code present in organisms and species that make each organism unique. In this lab, we will learn how to extract the DNA from a common fruit: strawberries. Strawberries are octoploid, meaning they have eight sets of chromosomes. We will be able to see the role of chemicals in the process of extracting DNA.



**Hypothesis (1 mark):**

**IF** \_\_\_\_\_,

**THEN** \_\_\_\_\_.

**Safety:**

Avoid contact with chemical solutions with eyes and all body tissues. Be sure to wear safety goggles, lab apron, and gloves at ALL times when in the lab. DO NOT drink or eat any of the materials provided within this lab. Make sure to wipe up any spills that may occur immediately during the lab. After the lab is complete, be sure to wash hands thoroughly with soap and water before leaving the laboratory.

**Materials:**

- Half strawberry per pair
- Isopropyl alcohol
- Ziploc bag
- 10 mL DNA extraction buffer
- Test tube
- Test tube rack
- Stir rod
- Eye dropper
- Scissors
- Beakers
- Graduated cylinder

**Procedure: Extraction Buffer**


1. Using a 100 mL graduated cylinder, measure out 50.0 mL of water. Pour the water into a clean beaker.
2. Using 10 mL graduated cylinder, measure out 2.5 mL of dish soap. Pour the dish soap into the same beaker with the water.
3. Measure out 0.30 g of salt.
4. Dissolve the salt into the soap and water solution by gently mixing it with a stir rod. Make sure that you are NOT producing bubbles within your solution.
5. This is now your extraction buffer.

### Procedure: DNA Extraction

1. Place the strawberry and 10 mL of extraction buffer into the plastic bag.
2. Carefully mash up the strawberry and buffer solution until it becomes a liquid. Do this for 5 min or until there are no large pieces of strawberry in the solution. Be careful that you **DO NOT** produce too many bubbles!
3. Cut a small hole in the corner of the Ziploc bag.
4. Pour the liquid solution into the test tube (make sure that there are no large chunks of strawberry and there are no bubbles present inside the test tube).
5. Using an eye dropper, slowly pour the isopropyl alcohol over the top of the strawberry mixture so that there is approximately a 5 cm layer of isopropyl alcohol on top of the strawberry mixture. **DO NOT** pour the isopropyl alcohol directly on top of the strawberry mixture! Be sure to pour the isopropyl alcohol along the sides of the test tube so that it rests on top of the mixture.
6. White strands will form in the isopropyl alcohol layer. In the Data/Observations section, draw and label a diagram of the DNA inside the test tube.
7. Use a stir rod to extract the strands from the test tube.

### Data/Observations:

Draw a sketch of the extracted DNA when it was in the test tube. Be sure to label the different parts of your diagram (both equipment and sample). (2 marks)



What are two **qualitative observations** from this experiment? (1 mark)

**Error Analysis:**

What are some sources of error in this experiment? *(1 mark)*

How may these sources of error affect your results? *(1 mark)*

**Analysis:**

1. What was the purpose of mashing up the strawberry into smaller pieces? *(1 mark)*
2. Within the extraction buffer solution, there was dishwashing soap, salt, and deionized water. What is the role of the detergent and salt in the extraction process? (Hint: think about where the DNA is located within the cell) *(1 mark)*
3. How do we know that we extracted the DNA and not another organelle? (Hint: think about the role of the detergent in the buffer solution) *(1 mark)*
4. If there is DNA in the food that we eat, why are you not harmed (or altered) by ingesting the DNA of another organism? *(1 mark)*

5. A person cannot see a single cotton thread four classrooms away. However, if you wound thousands of threads together into a rope, it would be visible at the same distance. How is this statement an analogy to our DNA extraction? *(1 mark)*
  
6. DNA can be found in living or once living cells. Explain how this might be important for scientists and/or historians. *(1 mark)*

### **Conclusion:**

Write a paragraph to summarize your results. Be sure to include the following questions in your response: *(5 marks)*

- A summary of your **results** for the experiment.
- If your **hypothesis** was **supported** or **rejected**.
- **Factors** that could have affected your results (i.e. sources of error)
  - *Do not include experimental errors like spilling, reading the scale incorrectly, etc.*
- What you would do **differently** if you were to **redo** this experiment.
  - *i.e. How could you reduce the factors that affected your results?*
- What can you **conclude** about this experiment?